VACCINE ALLOCATION MODEL

USER'S GUIDE

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Introduction

The Vaccine Allocation Model is intended to help public health officials determine if a given number of doses of a vaccine will be sufficient to vaccinate (treat) all of the person who wish to be treated. If the number of doses is insufficient, the Vaccine Allocation Model will determine how many persons in different target groups can receive treatment.

The Vaccine Allocation Model can be used either in the advance planning stages of a vaccination campaign or for support during a vaccination campaign. It is based on information published in the *Guidance on Allocating and Targeting Pandemic Influenza Vaccine*, available online at http://www.pandemicflu.gov/vaccine/allocationguidance.pdf

The Vaccine Allocation Model allows public health officials to enter information about the population in their jurisdiction and the number of doses of a vaccine that will be available in their jurisdiction. The model immediate determines how many persons in different target groups can receive treatment. A user can adjust the population of the target groups, add more target groups, modify the expected demand for each target group, and reprioritize target groups.

Because the Vaccine Allocation Model operates entirely in the Microsoft Excel environment, some familiarity with this package is helpful. In order to run the model, only one file is needed: "Vaccine Allocation Model.xls."

This user guide includes details on using the Vaccine Allocation Model. At each step, an example, with snapshots from the model, will be provided.

In 2004, Public Health Services of the Montgomery County, Maryland Department of Health and Human Services became one of the first eleven public health agencies in the nation to be recognized as Public Health Ready by the National Association of County and City Health Officials (NACCHO) and the Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health and Human Services. The county is home to an Advanced Practice Center (APCs) for Public Health Preparedness funded by NACCHO through the CDC. This APC and the University of Maryland have been collaborating since 2004 on providing models to public health officials to improve decision-making and emergency preparedness planning.

Important Terms

1. Vaccination: a single dose of a vaccine, a single shot. Also known as a "bolus." The Vaccine Allocation Model assumes that each person will receive two shots. Thus, the number of persons who can be treated is the number of available vaccinations divided by 2.
2. Population: the total number of people in a target group in a jurisdiction. Not everyone in a population will necessarily want to receive treatment.
3. Demand: the percentage of persons in a target group who will want to receive treatment. This may depend upon the pandemic severity.
4. Severity: the severity of a pandemic based on the proportion of individuals with pandemic illness who die (the "case fatality rate"). Pandemics are defined as "severe" (PSI categories 4 or 5), "moderate" (PSI category 3), and "less severe" (PSI categories 1 and 2).
5. Target Group: People targeted for vaccination defined by a common occupation, type of service, age group, or risk level. A target group is a group of persons with the same occupation or age and health status. Every person in the United States is included in one or more target groups. Target groups are vaccinated in tiers, with all groups in a tier vaccinated simultaneously.
6. Category: Pandemic vaccination target groups are clustered into four broad categories (homeland and national security, health care and community support services, critical infrastructures, and the general population). These four categories together cover the entire population.
7. Tier: A set of target groups in different categories. Vaccine will be allocated and administered according to tiers where all groups designated for vaccination within a tier have equal priority for vaccination. Groups within tiers vary depending on pandemic severity.
8. Severity: the severity of a pandemic based on the proportion of individuals with pandemic illness who die (the "case fatality rate"). Pandemics are defined as "severe" (PSI categories 4 or 5), "moderate" (PSI category 3), and "less severe" (PSI categories 1 and 2).

Using the Vaccine Allocation Model

Orientation

Open the “Vaccine Allocation Model.xls” workbook using Microsoft Excel.

The workbook consists of five worksheets:

- Main
- Target Groups
- Tiers
- Allocation
- Calculations

The workbook also contains one chart:

- Tier Allocation Chart

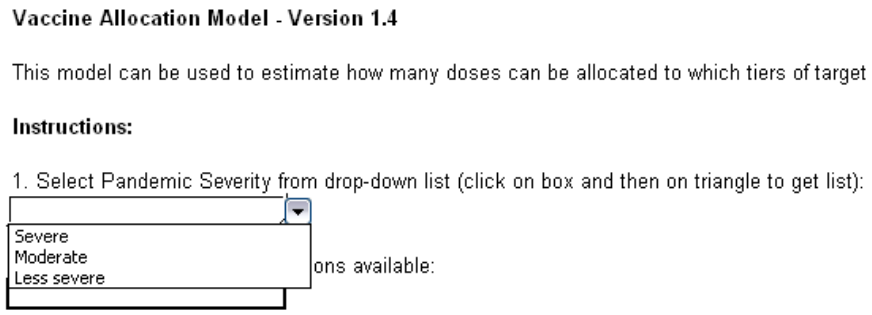
Go to a worksheet (or chart) by clicking on the tab with the corresponding name at the bottom of the worksheet.

The following pages describe each step of creating a Vaccine Allocation Model.

Steps 1 & 2: Main

Step 1

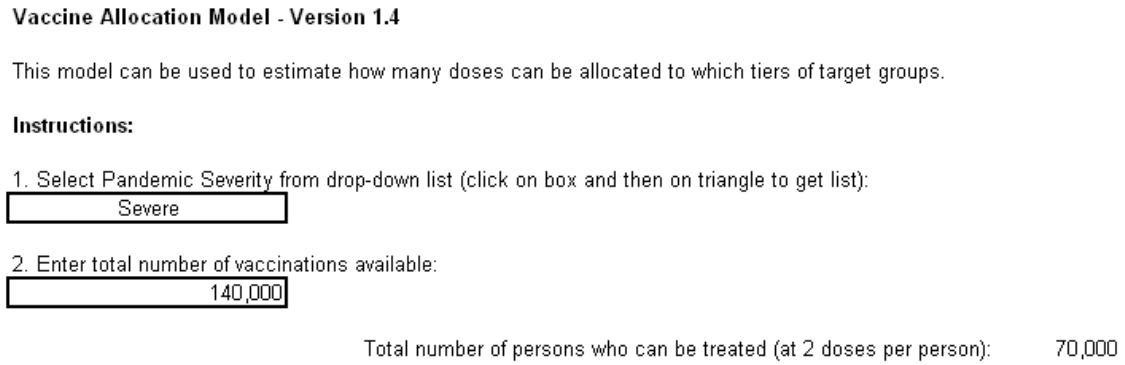
Go to the Main worksheet. Click on the box underneath the instructions "1. Select Pandemic Severity." Then click on the small triangle just to the right of the box. A pull-down list will appear with the options "Severe," "Moderate," and "Less severe." Click on one of these options.



Step 2

In the box underneath the instructions "2. Enter the total number of vaccinations available," enter the total number of vaccinations available. This is the number of doses (two doses per person), not the number of persons.

After a total number of vaccinations available is entered, the total number of person who can be treated will appear to the right of the label "Total number of persons who can be treated (at 2 doses per person)."



Step 3: Target Groups

Go to the Target Groups worksheet. Initially, this worksheet contains the list of target groups from the guidance document. Enter the total population for each target group in the corresponding box in Column D of this worksheet.

Any cells left blank will be treated as 0.

If desired, updated the demand percentages. There is a different demand percentage for each pandemic severity. 100% means that everyone in this target group will want to be treated in that scenario. Any value between 0 and 100% can be entered.

The group names in Column C can be changed. To do so, just type over the current target group name.

Other groups can be added to this list. Enter the group name in Column C between Row 9 and Row 70. Enter the population in Column D and the demand percentages in Columns F, G, and H of the same row as the group name.

Changes to the list of target groups on this worksheet will appear on the Tiers and Allocation worksheets. *Note: do not change the lists on the Tiers and Allocation worksheets.*

Target Groups worksheet

Enter the total population for each target group. If desired, updated the demand percentages.

	Total population in target group	Demand for vaccination in each target group based on pandemic severity (percentage)		
Homeland & National Security (HNS)				
		Pandemic Severity		
Target Group		Severe	Moderate	Less severe
Deployed and mission critical personnel	10,000	100%	100%	100%
Essential support and sustainment personnel	50,000	100%	100%	100%
Intelligence services		100%	100%	100%
Border protection personnel		100%	100%	100%
National Guard personnel		100%	100%	100%
Other domestic national security personnel		100%	100%	100%
Other active duty & essential support personnel	100,000	100%	100%	100%
Health Care & Community Support Services (HC/CSS)				
Target Group				
Public health personnel	20,000	75%	75%	75%
Inpatient health care providers		100%	100%	100%
Outpatient and home health care providers		100%	100%	100%
Health care providers in long-term care facilities (LTCFs)		100%	100%	100%
Community support and emergency management personnel	60,000	67%	67%	67%
Pharmacists		100%	100%	100%
Mortuary services personnel		100%	100%	100%
Other important health care personnel	200,000	50%	50%	50%

Step 4: Tiers

Go to the Tiers worksheet. This worksheet contains the list of target groups and the assignment of each target group to a tier, based on pandemic severity. Initially, these assignments represent the ones in the guidance document. Tier assignments in red are for "Not Targeted" groups; these were placed in the same tier as Healthy Adults for planning purposes.

The tier assignments can be modified. To do so, update the number in the corresponding cell. *Note: The tier assignment must be* 1, 2, 3, 4, *or* 5.

Tiers worksheet

If desired, updated the tier for each target group.

	Tier for each target group based on pandemic severity		
Homeland & National Security (HNS)			
	Pandemic Severity		
Target Group	**Severe**	**Moderate**	**Less severe**
Deployed and mission critical personnel	1	1	1
Essential support and sustainment personnel	2	2	2
Intelligence services	2	2	2
Border protection personnel	2	2	2
National Guard personnel	2	2	2
Other domestic national security personnel	2	2	2
Other active duty & essential support personnel	3	3	4
Health Care & Community Support Services (HC/CSS)			
Target Group			
Public health personnel	1	1	1
Inpatient health care providers	1	1	1
Outpatient and home health care providers	1	1	1
Health care providers in long-term care facilities (LTCFs)	1	1	1
Community support and emergency management personnel	2	2	4
Pharmacists	2	2	4
Mortuary services personnel	2	2	4
Other important health care personnel	3	3	4

Step 5: Main

Go to the Main worksheet. This worksheet now shows the allocation of vaccine to each tier. These numbers were calculated based on the inputs entered in Steps 1, 2, 3, and 4.

For each tier, the worksheet shows the number of vaccinations needed (based on the corresponding target groups and the demand in each target group) and the number of vaccinations (doses) allocated to that tier. The worksheet shows number of persons in that tier who want to be treated (based on the corresponding target groups and the demand in each target group) and the number of persons who can be treated. The worksheet shows the percentage of demand that can be satisfied.

Finally, the worksheet shows totals across all of the tiers.

5. View allocation by tier below:

	Tier					Total
	1	2	3	4	5	
Vaccinations needed for tier:	50,000	180,000	400,000	0	0	630,000
Vaccinations allocated:	50,000	90,000	0	0	0	140,000
Number of persons in tier:	25,000	90,000	200,000	0	0	315,000
Number who can be treated:	25,000	45,000	0	0	0	70,000
Percentage of persons in tier who will get treatment:	100%	50%	0%			22%

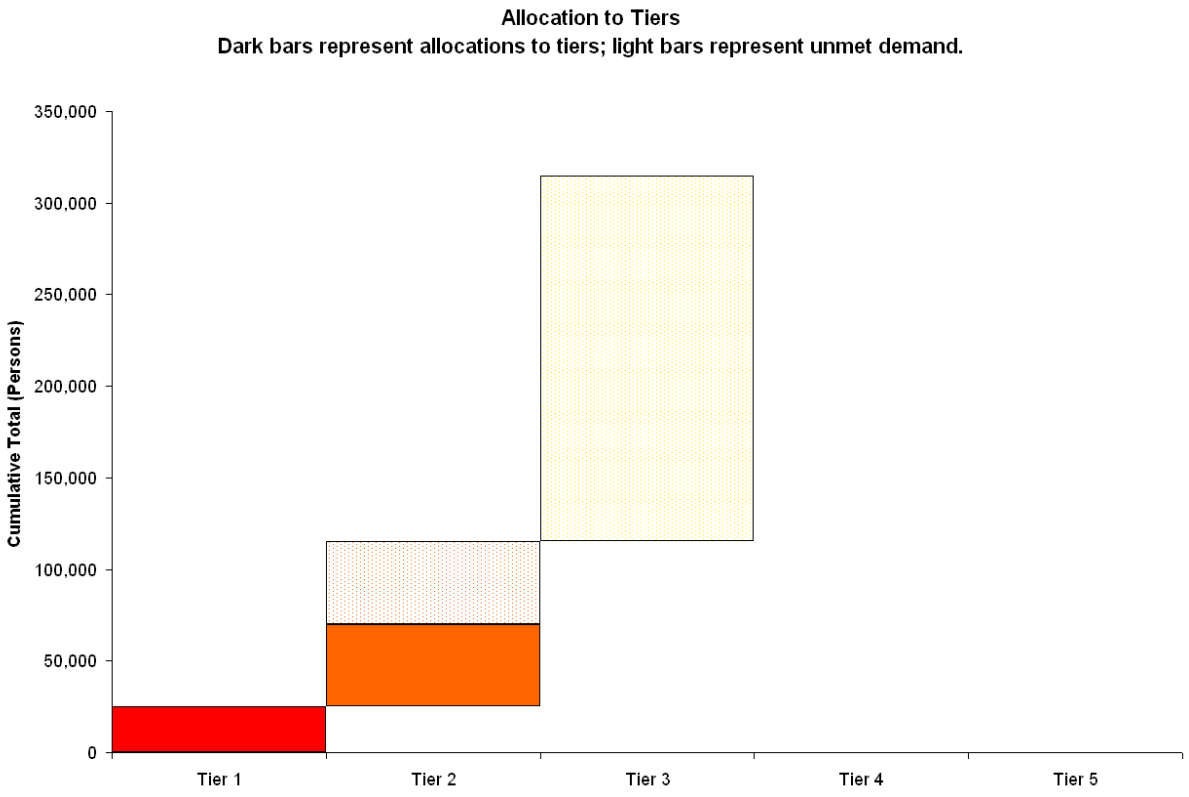
Step 6: Tier Allocation Chart

Go to the Tier Allocation Chart. This charts now shows the allocation of vaccine to each tier (like the table on the Main worksheet). These numbers were calculated based on the inputs entered in Steps 1, 2, 3, and 4.

For each tier, the chart shows the number of persons who can be treated as a dark (or solid) bar and the unmet demand (in persons) as a light (dotted) bar. The bars are offset vertically to indicate the total number of persons who can be treated.

The tiers are color-coded:
Tier 1: red
Tier 2: orange
Tier 3: yellow
Tier 4: green
Tier 5: blue

Typically, the high-priority tiers will be completely solid because their allocations are enough to meet their demand. Then there will be a tier in which some of the demand is met and some is unmet. The remaining low-priority tiers receive no allocation, so all of their demand is unmet.



Step 7: Allocation

Go to the Allocation worksheet. This worksheet now shows the allocation of vaccine to each target group. These numbers were calculated based on the inputs entered in Steps 1, 2, 3, and 4.

For each target group, the worksheet shows the number of vaccinations needed in that target group (based on the population and the demand) and the number of vaccinations (doses) allocated to that target group. The worksheet shows number of persons in that target group who want to be treated (based on the population and the demand) and the number of persons who can be treated. The worksheet shows the percentage of demand that can be satisfied.

Allocation worksheet

Homeland & National Security (HNS)	Expected number of persons who will need treatment in target group	Number of persons who can be treated in target group	Number of vaccinations needed for target group	Number of vaccinations allocated to target group	Percentage
Target Group					
Deployed and mission critical personnel	10,000	10,000	20,000	20,000	100%
Essential support and sustainment personnel Intelligence services Border protection personnel National Guard personnel Other domestic national security personnel	50,000	25,000	100,000	50,000	50%
Other active duty & essential support personnel	100,000	0	200,000	0	0%
Health Care & Community Support Services (HC/CSS)					
Target Group					
Public health personnel Inpatient health care providers Outpatient and home health care providers Health care providers in long-term care facilities (LTCFs)	15,000	15,000	30,000	30,000	100%
Community support and emergency management personnel Pharmacists Mortuary services personnel	40,000	20,000	80,000	40,000	50%
Other important health care personnel	100,000	0	200,000	0	0%

Changing a Model

At any point, one can go back to the Main worksheet, Target Groups worksheet, or Tiers worksheet to modify the inputs already entered. The results in the Main worksheet and the Allocation worksheet will change immediately as well.

To change or add target groups, go to the Target Groups worksheet. The group names in Column C can be changed. To do so, just type over the current target group name. To add a target group, enter the group name in Column C between Row 9 and Row 70. Enter the population in Column D and the demand percentages in Columns F, G, and H of the same row as the group name. Changes to the list of target groups on this worksheet will appear on the Tiers and Allocation worksheets. *Note: do not change the lists on the Tiers and Allocation worksheets.*

Vaccine Allocation Rules

This section describes the algorithm used to allocate vaccinations (doses) to target groups.

1. Total number of persons who can be treated = the total number of vaccinations available divided by 2.

2. According to the pandemic severity, each target group's demand equals the target group's total population times the target group's demand percentage.

3. According to the pandemic severity, each target group is assigned to a tier.

4. Each tier's demand equals the sum of the demand of the target groups in that tier.

5. The Tier 1 allocation = the minimum of the Tier 1 demand and the total number of persons who can be treated. The Tier 1 remainder = the total number of persons who can be treated - the Tier 1 allocation.

6. The Tier 2 allocation = the minimum of the Tier 2 demand and the Tier 1 remainder. The Tier 2 remainder = the Tier 1 remainder - the Tier 2 allocation.

7. The Tier 3 allocation = the minimum of the Tier 3 demand and the Tier 2 remainder. The Tier 3 remainder = the Tier 2 remainder - the Tier 3 allocation.

8. The Tier 4 allocation = the minimum of the Tier 4 demand and the Tier 3 remainder. The Tier 4 remainder = the Tier 3 remainder - the Tier 4 allocation.

9. The Tier 5 allocation = the minimum of the Tier 5 demand and the Tier 4 remainder. The Tier 5 remainder = the Tier 4 remainder - the Tier 5 allocation.

10. Each tier's allocation percentage = that tier's allocation / that tier's demand.

11. The allocation to each target group = that target group's demand times the allocation percentage for the tier to which the target group is assigned. Note that this is number of person who can be treated.

12. The number of vaccinations (doses) allocated to each tier and target group = 2 times the allocation to each tier and target group.

Example

This example is extremely simplified to illustrate the calculations. It does not represent a realistic scenario. The values are classified as INPUT (those supplied by the user) or CALCULATED (those determined by the Vaccine Allocation Model).

INPUT: The total number of vaccinations available = 140,000.

CALCULATED: Total number of persons who can be treated = 140,000 / 2 = 70,000.

There are six target groups. Two target groups (A & B) are assigned to Tier 1. Two target groups (C & D) are assigned to Tier 2. Two target groups (E & F) are assigned to Tier 3.

INPUT: The total population for the six target groups:
A: 10,000
B: 20,000
C: 50,000
D: 60,000
E: 100,000
F: 200,000

INPUT: The demand percentages (based on the pandemic severity) for the six target groups:
A: 100%
B: 75%
C: 100%
D: 67%
E: 100%
F: 50%

CALCULATED: The demand for the six target groups:
A: 100%(10,000) = 10,000
B: 75%(20,000) = 15,000
C: 100%(50,000) = 50,000
D: 67%(60,000) = 40,000
E: 100%(100,000) = 100,000
F: 50%(200,000) = 100,000

CALCULATED: The demand for the tiers:
Tier 1: 25,000
Tier 2: 90,000
Tier 3: 200,000

CALCULATED: The allocation to the tiers:
Tier 1: 25,000 (with a remainder of 70,000 - 25,000 = 45,000)
Tier 2: 45,000 (with no remainder)
Tier 3: 0

CALCULATED: Each tier's allocation percentage:
Tier 1: 25,000 / 25,000 = 100%
Tier 2: 45,000 / 90,000 = 50%
Tier 3: 0 / 200,000 = 0%

CALCULATED: Each target group's allocation (number of persons who can be treated):
A: 100%(10,000) = 10,000
B: 100%(15,000) = 15,000
C: 50%(50,000) = 25,000
D: 50%(40,000) = 20,000
E: 0%(100,000) = 0
F: 0%(100,000) = 0

CALCULATED: Each target group's allocation (number of vaccinations or doses):
A: 2 x 10,000 = 20,000
B: 2 x 15,000 = 30,000
C: 2 x 25,000 = 50,000
D: 2 x 20,000 = 40,000
E: 2 x 0 = 0
F: 2 x 0 = 0

Additional Information

See the project web site at http://www.isr.umd.edu/Labs/CIM/projects/clinic/

If you have questions or suggestions, please contact Jeffrey Herrmann at the following address:

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